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Please add new claims 48-49 as follows:

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48. (New) A reactor according to claim 19, wherein the fluid flow channels are formed with a tool.

49. (New) A reactor according to claim 48, wherein the fluid flow channels are formed with a water jet.

REMARKS

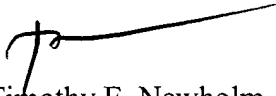
Entry of the amendments is respectfully requested. The specification has been amended to correct a typographical error noted upon a review thereof. Claims 28, 39, and 47 have been cancelled. Claims 19, 21, 22, 31, 32, 36, 37, and 44-46 have been amended to more positively recite and distinctly claim that which applicants regard as their invention. New claims 48-49 have been added for the same reason. Claims 19-27, 29-38, 40-46, and 48-49 are pending in the application.

CONCLUSION

A check for \$36 is enclosed in payment of the fee associated with the submission of 2 additional claims in excess of 20 by a large entity. No other fees are believed to be payable with this communication. Nevertheless, should the Examiner consider any other fees to be payable in conjunction with this or any future communication, the Director is authorized to direct payment of such fees, or credit any overpayment to Deposit Account No. 50-1170.

The application is now ready for examination on the merits. Early notification of such action is earnestly solicited.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Timothy E. Newholm', with a long horizontal stroke extending to the right.

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

Amended Specification Paragraphs

Paragraph beginning on line 1, page 9:

The invention can also be applied to non-catalytic processes, wherein there may be one or more reactor compartments, bounded by plate or PCHE type heat exchangers at the inlet and/or outlet. Possible embodiments of the reactor may be considered as analogous to the foregoing catalytic reactor descriptions, with suitably dimensioned reactor compartment(s) in place of the catalytic bed(s).

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VERSION WITH MARKINGS TO SHOW CHANGES MADE
Amended Claims

Please substitute pending claims 19, 21, 22, 31, 32, 36, 37, and 44-46 with the corresponding amended claims as follows:

19. (Amended) A reactor comprising
- (a) a reaction zone; and
 - (b) a heat exchanger in operative contact with the reaction zone so as to receive reactants for heat exchange purposes, wherein the heat exchanger is formed from a heat exchange panel that includes a plurality of superposed metal printed circuit heat exchange (PCHE) plates bearing fluid flow channels, the channel-bearing PCHE plates being (i) aligned during superposition to define discrete heat exchange pathways for fluids, and (ii) diffusion bonded together.
21. (Amended) A reactor according to claim 19, wherein the fluid flow channels are formed by chemically etching the channel-bearing PCHE plates.
22. (Amended) A reactor according to claim 19, wherein the fluid flow channels are formed by hydraulically ~~etching~~ milling the channel-bearing PCHE plates.
31. (Amended) A process of fluid reactant conversion comprising:
- (a) providing a reactor including a reaction zone and a printed circuit heat exchanger (PHCE) in operative contact with the reaction zone;

(b) providing a fluid reactant species to be converted in the reaction zone ~~at a predetermined stage of reaction;~~

(c) introducing at least a portion of the fluid reactant species into the reaction zone at a predetermined stage of reaction through a discrete reactant fluid pathway within the heat exchanger~~PCHE~~; and

(d) introducing an auxiliary fluid at a temperature differing from that of the fluid reactant species into another discrete fluid pathway within the heat exchanger and juxtaposed to the reactant fluid pathways, whereby the discrete nature of the respective pathways permits only indirect heat exchange between the fluid reactant species and the auxiliary fluid.

32. (Amended) An apparatus for controlling a temperature profile of a reactant fluid in the presence of a catalyst during an endothermic or exothermic chemical reaction, the apparatus comprising:

(a) a reactor having a reactant fluid inlet and reactant fluid outlet;

(b) catalytic beds provided in the reactor between the reactant fluid inlet and the reactant fluid outlet;

(c) a printed circuit heat exchanger (PCHE) that separates two adjacent catalytic beds from one another, ~~the heat exchanger~~PCHE including a heat exchanging fluid inlet, a heat exchanging fluid outlet, a first channel for passage of a heat exchanging fluid, and a second channel in communication with the adjacent catalytic beds to allow passage of a reactant fluid from one catalytic bed to the next, the second channel being ~~fluidically-separated~~ from the first channel to maintain separation of the heat exchange fluid and the reactant liquid.

36. (Amended) A process for indirectly controlling a temperature profile of a ~~reaction~~reactant fluid in the presence of a catalyst during an endothermic or exothermic chemical reaction, the processing comprising:

(a) passing ~~at~~the reactant fluid from a reactant fluid inlet in a reactor through a first catalytic bed,

(b) then passing the reactant fluid through a first channel in a printed circuit heat exchanger (PCHE);

(b) then passing the reactant fluid through a second catalytic bed;

(c) passing a heat exchanging fluid from a heat exchanging inlet in the PCHE to a heat exchanging outlet through a second channel in the PCHE, the first and second channels being ~~fluidically~~fluidically-separated from one another; and

(d) indirectly exchanging heat between the heat exchanging fluid and the reactant fluid in the PCHE.

37. (Amended) A reactor comprising:

(a) a reactant fluid inlet;

(b) a reactant fluid outlet;

(c) first and second adjacent catalyst beds each including a catalyst;

(d) a printed circuit heat exchanger (PCHE) arranged between the first and second catalyst beds, the ~~heat exchanger~~PCHE including at least two channels formed therein ~~in fluidic separation~~that are separated from one another, the first channel permitting flow of reactant fluid from the first catalytic bed to the second catalytic bed, and the second channel permitting flow of a heat exchange fluid therethrough.

44. (Amended) A method of making a reactor, comprising:
- (a) providing a reactor shell having a reaction zone disposed therein;
 - (b) making a heat exchange panel by
 - 1) superpositioning metal printed circuit heat exchange (PCHE) plates such that surface structures on the metal PCHE plates form fluid flow channels between adjacent metal plates, and
 - 2) diffusion bonding the metal PCHE plates together; and
 - (c) positioning the heat exchange panel in the reactor shell in operative contact with the reaction zone so as to receive reactants and auxiliary fluids for indirect heat exchange purposes.
45. (Amended) A method according to claim 44, wherein the fluid flow channels are formed by chemically etching the surfaces of the metal PCHE plates.
46. (Amended) A method according to claim 44, wherein the fluid flow channels are formed by hydraulically etching the surfaces of the metal PCHE plates.